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IS 15696 (2006): Supplier's data sheet for power boiler
[MED 1: Boilers and Pressure Vessels]

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भारतीय मानक

पावर बायलर के लिये सप्लायर का आँकड़ा पत्र

Indian Standard

SUPPLIER'S DATA SHEET FOR POWER BOILER

ICS 27.060.30

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 2006

Price Group 10

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Boilers and Pressure Vessels Sectional Committee had been approved by the Mechanical Engineering Division Council.

The information provided by the manufacturer/supplier according to this data sheet would enable the purchaser to assess his exact requirements in selecting a most suitable type of equipment. List of drawings and documents to be supplied by the manufacturers/suppliers against enquiry/quotation are given in Annex A.

The composition of the Committee responsible for the formulation of this standard is given at Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

Indian Standard

SUPPLIER'S DATA SHEET FOR POWER BOILER

1 SCOPE

This standard covers the drawings, documents and minimum technical parameters to be provided by the manufacturers/suppliers against enquiry or quotation of a purchaser.

2 TECHNICAL PARAMETER FOR STEAM GENERATOR AND ITS AUXILIARIES

2.1 General

a) Design code :
b) Manufacturer :
c) Type of boiler :
d) Type of furnace :
e) Type of fuel :

2.1.1 *Furnace Details* :

2.1.1.1 *Water tubes*

a) Number :
b) Construction of water wall :
c) Outside diameter/thickness, mm :
d) Spacing, mm :
e) Material :
f) Design pressure, kg/cm^2 :
g) Maximum metal temperature, °C :
h) Flat projected heating surface, m^2 :

2.1.1.2 *Water headers (location)*

a) Number :
b) Outside diameter/thickness, mm :
c) Design pressure, kg/cm^2 :
d) Design temperature, °C :
e) Material :

2.1.1.3 *Size of furnace*

a) Width, m :
b) Depth, m :
c) Height, m (central line of furnace bottom header to furnace roof) :
d) Volume, m^3 :

2.1.1.4 *Furnace roof*

a) Construction :
b) Tube outside diameter, mm :
c) Tube pitch, mm :

d) Tube thickness, mm :
e) Tube material :

2.1.1.5 *Item-wise all other details as applicable* :

2.1.1.6 *Furnace design pressure, water column* :

2.1.2 *Drum* :

2.1.2.1 *Overall length (overheads)*, mm :

2.1.2.2 *Shape of head (ellipsoidal, hemispherical, etc)* :

2.1.2.3 *Inside diameter*, mm :

2.1.2.4 *Thickness, of shell and head*, mm :

2.1.2.5 *Design pressure*, kg/cm^2 :

2.1.2.6 *Design temperature*, °C :

2.1.2.7 *Type of steam generation arrangement* :

2.1.2.8 *Number of thermo-couples fitted* :

2.1.2.9 *Expected maximum temperature differential between any parts of the drum* :

a) Normal operation, °C :
b) Accelerated starting, °C :

2.1.2.10 *Steam separators*

a) Number :
b) Type :
c) Manufacturer :

2.1.2.11 *Steam scrubbers*

a) Number :
b) Type :
c) Manufacturer :

2.1.2.12 *Drier*

a) Type :
b) Pressure drop, kg/cm^2 :
c) Velocity of steam, m/s :
d) Manufacturer :

2.1.2.13 *Drum hold up capacity, in second*

a) Between normal water level and low level trip at rated output :
b) Between high level and low level trip :

2.1.2.14 *Material of drum* :

2.1.3 *Super Heater*

Following details are to be furnished for individual section of super heater.

2.1.3.1 *Number of banks* :

2.1.3.2 *Type*

a) Pendant/Horizontal :
b) Parallel/Counter flow :

2.1.3.3 *Effective heating surface*, m^2 :

2.1.3.4 *Number of tubes: (No. of assemblies/elements)* :

Construction: Inline/staggered

2.1.3.5 *Outside diameter of tubes/thickness*, mm :

2.1.3.6 *Tube spacing*, mm :

a) Parallel to gas flow :
b) Across gas flow :

2.1.3.7 *Maximum gas temperature, °C at inlet of bank at 100 percent BMCR while firing design coal* :

2.1.3.8 *Maximum expected gas side metal temperature*, °C :

2.1.3.9 *Material* :

2.1.3.10 *Super heater headers*

a) Number :
b) Outside diameter, mm :
c) Thickness, mm :
d) Material :
e) Design pressure, kg/cm^2 :
f) Design temperature, °C :

2.1.3.11 *Number of thermocouples fitted* :

2.1.3.12 *Method of super heater alignment and support — description* :

2.1.3.13 *Attemperator*

Following details to be furnished for first stage and second stage attemperators as applicable:

a) Type :
b) Number :
c) Size of header, mm :
d) Spray nozzle detail :
e) Spray quantity at load 100 percent BMCR, kg/h :
f) Spray quantity at load 100 percent TMCR, kg/h :
g) Spray quantity at lower super heater control load, kg/h :
h) Spray quantity at HP HTR out condition at 100 percent BMCR and at SH control load, kg/h :
j) Number of thermocouples, if fitted :

2.1.3.14 *Material of attemperators (body, spray nozzle, etc)* :

2.1.3.15 *Temperature probe at super heater inlet/air heater inlet zones — description* :

2.1.4 *Re-heater*

Following details are to be furnished for individual section of re-heater.

2.1.4.1 *Type*

a) Pendant/vertical/horizontal :
b) Parallel/counter flow :

2.1.4.2 *Effective heating surface*, m^2 :

2.1.4.3 *Construction* :

a) Inline/staggered. :
b) Number of elements wide across gas flow :
c) Number of tubes in each element deep along gas flow :

2.1.4.4 *Size of tubes* :

a) Outside diameter, mm :
b) Thickness, mm :

2.1.4.5 *Tube spacing*, mm :

a) Parallel to gas flow :
b) Across gas flow :

2.1.4.6 *Material* :

2.1.4.7 *Maximum gas temperature at inlet of bank at 100 percent BMCR while firing design coal*, °C :

2.1.4.8 *Maximum expected gas side metal temperature*, °C :

2.1.4.9 *Re-heat headers*

a) Number :
b) Outside diameter, mm :
c) Thickness, mm :
d) Material :
e) Design pressure, kg/cm^2 :
f) Design temperature, °C :

2.1.4.10 *Number of thermocouple fitted*, °C :

2.1.4.11 *Method of re-heater alignment and support—description* :

2.1.4.12 *Emergency attemperator (for re-heater system)*

a) Type and numbers :
b) Size of header, mm :
c) Maximum spray quantity, kg/h :
d) Material of attemperator (body, spray nozzle, etc) :

2.1.5 *Economizer*

2.1.5.1 *Economizer tube coils*

a) Type :
  1) Counter/parallel flow, :
  2) Plain/fins :
b) Number :
  1) Number of banks, :
  2) Number of elements in each bank :

c) Construction: Inline/staggered :
d) Outside diameter/thickness, mm :
e) Design pressure, kg/cm^2 :
f) Design temperature, °C :
g) Material :
h) Tube pitch along gas flow, mm :
j) Tube pitch across gas flow, mm :
k) Maximum expected gas side metal temperature, °C :
m) Maximum gas temperature at inlet of economizer at 100 percent BMCR while firing design coal °C :

2.1.5.2 *Headers*

a) Number :
b) Outside diameter/thickness, mm :
c) Material :
d) Design pressure, kg/cm^2 :
e) Design temperature, °C :
f) Maximum metal temperature °C :

2.1.5.3 *Economizer effective heating surface*, m^2 :

2.1.6 *Air Heaters* :

2.1.6.1 *Type (rotary/tubular)* :

2.1.6.2 *Rotary airheaters* :

a) 1) Numbers :
    2) Type (Bi-sector, Tri-sector) :
b) Gas flow area, m^2 :
c) Air flow area, m^2 :
d) Material of different parts :
e) Cleaning arrangement :
f) Effective heating surface, m^2 :
g) Maximum operating temperature, °C :
h) Height of elements with type and material :
    1) Hot layer :
    2) Intermediate layer :
    3) Cold layer :
j) Drive details (kW and rev/min) :
k) Air motor drive details :
    1) Air requirement Nm^3/h :
    2) Air pressure :
    3) Any other detail :

2.1.6.3 *Tubular air heater* :

Following information to be furnished for both primary and secondary as applicable

a) Number of gas passes :
b) Number of air passes :
c) Area to gas flow, m^2 :
d) Area to air flow, m^2 :

e) Tube outside diameter, mm :

f) Tube thickness, mm :

g) Material :

h) Type of arrangement :

j) Tube length, m :

k) Number :

m) Erosion protection :

1) Replaceable ferrules for tube end at gas entry point (provided/not provided) :

2) Refractory layer on top of tube plate at first gas entry point (provided/not provided) :

n) Total effective heating surface, m^2 :

2.1.7 *Steam Coil Air Preheater* (if provided) :

2.1.7.1 *Type* :

2.1.7.2 *Number* :

2.1.7.3 *Tube details*

a) Tube outside diameter and thickness, mm :

b) Material :

c) Type of arrangement :

d) Number of tubes :

e) Length of tube, mm :

f) Total heating surface area, m^2 :

2.1.7.4 *Steam pressure*, kg/cm^2 :

2.1.7.5 *Maximum operating temperature*, °C :

2.1.7.6 *Steam flow*, kg/h :

2.1.7.7 *Air flow*, m^3/min :

2.1.7.8 *Air inlet temperature*, °C :

2.1.7.9 *Air outlet temperature*, °C :

2.1.7.10 *Effective surface area*, m^2 :

2.1.8 *Burners* :

2.1.8.1 *Oil burners* :

2.1.8.1.1 *Number and type of burners* :

2.1.8.1.2 *Turn down ratio* :

2.1.8.1.3 *Location of burners* :

2.1.8.1.4 *Number of burners required for rated output* :

2.1.8.1.5 *Maximum capacity of each burner*, t/h :

2.1.8.1.6 *Minimum capacity*, t/h :

2.1.8.1.7 *Oil pressure*, kg/cm^2 :

2.1.8.1.8 *Pressure of atomizing steam*, kg/cm^2 :

2.1.8.1.9 *Consumption of atomizing steam*, kg/h, *Max* :

2.1.8.1.10 *Rate of firing light oil during cold start-up of boiler*, t/h :

2.1.8.1.11 *Duration of light oil firing during cold start-up of boiler*, h :

2.1.8.1.12 *Rate of firing heavy oil during cold start-up*, t/h :

2.1.8.1.13 *Duration of heavy oil firing during cold start-up*, h :

2.1.8.1.14 *Boiler load at which pulverized coal can be introduced, percentage of MCR* :

2.1.8.1.15 *Boiler load below which stabilization of coal flame is required, percentage of MCR* :

2.1.8.1.16 *Rate of heavy oil firing for stabilizing coal flame*, t/h :

2.1.8.1.17 *Details of tilting arrangement, if provided* ;

2.1.8.2 *Coal burners* :

2.1.8.2.1 *Number and type of burners* :

2.1.8.2.2 *Turn down ratio* :

2.1.8.2.3 *Number of burners fed by each pulverizer* :

2.1.8.2.4 *Arrangement and number of elevations* :

2.1.8.2.5 *Number of burners in operation at 100 percent BMCR* :

2.1.8.2.6 *Details of tilting arrangement, if provided* :

2.1.8.2.7 *Degree of ± tilt at 100 percent TMCR* :

2.1.8.2.8 *Temperature of coal and air mixture*, °C :

2.1.8.2.9 *Temperature of hot air*, °C :

2.1.8.2.10 *Velocity of secondary air at entry to burner*, m/s :

2.1.8.2.11 *Capacity of each burner at BMCR*, t/h :

2.1.8.2.12 *Material for nozzle tips* :

2.1.8.2.13 *Boiler load below which stabilization of coal flame is required, percentage of MCR* :

2.1.8.2.14 *Maximum NO_x emission at 6 percent O_2 level (if applicable)* (gm/giga joules) :

2.1.9 *Igniters*

a) Number :
b) Type :
c) Location :
d) Capacity, l/s :
e) Any other detail :

2.1.9.1 *Scanner*

a) Type :
b) Number :
c) Location :
d) Any other detail :

2.1.9.2 *Scanner cooling air system*

a) Number of scanner air fans :
b) Type :
c) Supply/discharge pressure :
d) Design capacity of each fan, m^3/h :
e) Design temperature, °C :
f) Motor rating and RPM — kW/rev/min :

2.1.10 *Air and Gas Ducts Areas (Data to be provided for all following application)*

a) Air duct area at various locations, m^2 :
b) Gas duct area at various locations, m^2 :
c) Thickness of air duct, mm :
d) Thickness of gas duct, mm :

2.1.11 *Soot Blowers*

Data to be provided for all the following applications

a) Furnace :
b) Super heater/re-heater :
c) Economizer :
d) Air heater :

2.1.11.1 Type

a) Short :
b) Retractable :

2.1.11.2 *Manufacturer* :

2.1.11.3 *Number* :

2.1.11.4 *Duration cycle of operation (total time), Min* :

2.1.11.5 *Length of travel*, mm :

2.1.11.6 *Steam consumed/cycle*, kg :

2.1.11.7 *Steam consumed*/24 h :

2.1.11.8 *Material of different parts* :

2.1.11.9 *Blowing rate*, kg/h :

2.1.11.10 *Blowing pressure*, kg/cm^2 :

2.1.11.11 *Drive details*, kW/rev/min :

2.1.12 *Pulverizer* :

2.1.12.1 *Type* :

2.1.12.2 *Number* :

2.1.12.3 *Numbers in operation at boiler MCR with*

a) Design coal :
b) Worst coal :

2.1.12.4 *Coal consumption at 100 percent MCR, t/h* :

a) With design coal :
b) With worst coal :

2.1.12.5 *Speed*, rpm :

2.1.12.6 *Required power*, kW :

2.1.12.7 *Motor size*, kW :

2.1.12.8 *Maximum feed size to mill*, mm :

2.1.12.9 *Mill capacity (specify capacity with fineness and HGI)*

a) Maximum, t/h :
b) Minimum for operation without chattering/before withdrawal, t/h :

2.1.12.10 *Mill oil cooler surface*, m^2

a) Size and gauge of tubes :
b) Design maximum pressure, kg/cm^2 :

2.1.12.11 *Temperature rise in mill gear box above 40°C ambient* :

2.1.12.12 *Mill operating temperature range*, °C :

2.1.12.13 *Torque required for tempering air damper operation*, kg m :

2.1.12.14 *Minimum life of mill wear parts, grinding elements*

a) Body and end plate liners :
b) Ribbon screw :
c) Grinding rings :
d) Grinding rolls/balls :
e) Rotating tubes :
f) Classifier vanes :
g) Classifier cone :
h) Chains :
j) Pulverized coal piping :

2.1.12.15 *Feeders*

a) Type :
b) Number :
c) Size :
d) Rated capacity, each t/h :
e) Rated power required, kW :
f) Rate of motor provided, kW :
g) Feeder speed range, rpm :
h) Feeder control drive :

2.1.12.16 *Primary air fans (cold fan/hot fan)*

a) Type :
b) Number :
c) Size :
d) Maximum capacity, m^3/s :
e) Minimum capacity, m^3/s :
f) Speed, rpm :

g) Pressure developed, mm of water at design point :
h) Power required, at design point :
j) Rate of motor provided, kW :
k) Material and thickness of fan parts, mm :
m) Casing :
n) Liners :
p) Blades :
q) Dampers :
r) Water required for bearing cooling, l/s :
s) Pressure range of water, mm :
t) Damper control drive torque, kg m :
u) Head-capacity curve furnished :
v) Operating temperature, °C :
w) Type of coupling :
y) Type of control :
z) Type of lubrication :

2.1.12.17 *Pulverized coal pipes*

a) Material :
b) Numbers per mill and outside diameter of pipe from mill to burner, mm :
c) Thickness, mm :
d) Coal pipe straight portion (material, lining and thickness) :
e) Coal pipe bends (material, lining and thickness) :

2.1.12.18 *Seal air fans*

a) Number :
b) Type :
c) Size :
d) Capacity, m^3/s :
e) Pressure developed, mm of water :
f) Speed, rpm :
g) Power required, at design point, kW :
h) Rate of motor provided, kW :
j) Material and thickness of fan parts, mm :
k) Casing :
m) Liners :
n) Blades :
p) Dampers, if any :
q) Mode of bearing cooling :

2.1.12.19 *Data for drive motors to be furnished in standard proforma* :

2.1.13 *Fans (FD and I.D.)* : FD (Forced Draft) I.D. (Induced Draft)

2.1.13.1 *Numbers* :
c) Size :
d) Maximum capacity, m^3/s :
e) Minimum capacity, m^3/s :
f) Speed, rpm :

a) Capacity m^3/s :
b) Pressure, mm of water :
c) Temperature, °C :
d) Efficiency at normal capacity, percent :
e) Motor rating, kW and rev/min :
f) Drive motor margin considered over test block condition :

2.1.13.4 *Test block rating*

a) Capacity, m^3/s :
b) Pressure, mm of water :
c) Temperature, °C :
d) Efficiency at normal capacity, percent :
e) Motor rating, kW :

2.1.13.5 *Fan maximum speed*, rev/min :

2.1.13.6 *Fan critical speed*, rev/min :

2.1.13.7 *Fan tip velocity*, m/s :

2.1.13.8 *Inlet size*, mm :

2.1.13.9 *Outlet size*, mm :

2.1.13.10 *Material and thickness of fan parts*

a) Casing, mm :
b) Side plates, mm :
c) Scroll plates, mm :
d) Scroll liners, mm :

2.1.13.11 *Rotor and shaft details*

a) GD^2, kg m^2 :
b) Blade material :
c) Shaft material :
d) Shaft size in wheel, mm :
e) Shaft size in bearings, mm :
f) Type of bearings :
g) Type of bearing lubrication :
h) Cooling water for bearings, l/s :
j) Torque required for damper control each set, kg.m :

2.1.13.12 *Drive motor*

Data on motor to be furnished in standard proforma.

2.1.13.13 *Type of speed control* :

2.1.13.14 *Coupling type* :

2.1.13.15 *Weight of entire fan*, tonne :

2.1.13.16 *Weight of rotor and shaft*, tonne :

2.1.13.17 *Weight of rotor and drive*, tonne :

2.1.13.18 *Weight of readable section of housing*, tonne :

2.1.13.19 *Type of fan lubrication* :

2.1.13.20 *Head-capacity curve furnished* :

2.1.14 *Boiler Mountings* Boiler Drum Super Heater Re-heater

2.1.14.1 *Safety valve (spring loaded/electromatic)*

- a) Type (spring loaded/electromatic) :
- b) Manufacturer :
- c) Size (inlet/outlet) :
- d) Number :
- e) Set pressure, kg/cm^2 :
- f) Capacity, t/h

2.1.14.2 *Gauge glass fittings*

- a) Number :
- b) Size :
- c) Type :
- d) Location :

2.1.14.3 *Gate/globe valves*

- a) Number :
- b) Size :
- c) Material :
  - 1) Body :
  - 2) Internals :

2.1.14.4 *Blow down valves*

- a) Number :
- b) Size :
- c) Material :
- d) Body :
- e) Internals :

2.1.14.5 *Pressure gauge range* :

2.1.14.6 *Temperature gauge range* :

2.1.15 *Chimney*

- a) Type :
- b) Height, m :
- c) Diameter at base, m :
- d) Diameter at top, m :
- e) Velocity of flue gases at chimney, m/s :
- f) Material :

2.1.16 *Insulation and Refractory*

- a) Type :
- b) Material :
- c) Surface area, m^2 :
- d) Thickness, mm :
- e) Locations

2.1.17 *Sub-contractors or Manufacturers for*

- a) Drums :
- b) Headers :
- c) Tubes and pipes :

d) Super heaters :
e) Re-heaters :
f) Fans :
g) Speed control for fans :
h) Pulverizes :
j) Burners :
k) Ignition system :
m) Motors :
n) Economizer :
p) Air preheaters :
q) Structural steel and steelwork :
r) Soot blowers :
s) Insulation and refractory :
t) Any other :

2.1.18 *Shipping Weight*

2.1.18.1 *Estimated net weight of all components without piping*, tonne :

2.1.18.2 *Estimated shipping weight crated for ocean shipment*, tonne :

2.1.18.3 *Estimated shipping weight of heaviest lift with name of parts*, tonne :

2.1.18.4 *Estimated shipping size of bulkiest part with name of parts*, tonne :

Size (Length × Breadth × Height), mm :

2.1.18.5 *Approximate tonnage which will be shipped each month until completion of supply*, tonne :

2.1.18.6 *Approximate weight of the following parts*, tonne :

1) Drums :
   i) With internals :
   ii) Without internals :
2) Water walls :
3) Steam cooled cage, if any :
4) Roof tubes :
5) Furnace hopper :
6) Headers :
7) Down comers :
8) Economizer :
9) Super heaters :
10) Re-heaters :
11) De-superheater :
12) Integral pipings, supplies and risers :
13) Burners :
14) Coal mills :
15) Coal piping :
16) Access doors and inspection doors :
17) P.A. fans :

18) I.D. fan :
19) F.D. fan :
20) Soot blowers :
21) Air heaters :
22) Motors :
23) Casings :
24) Ducts :
25) Structurals :
26) Walk ways and stairways :
27) Refractory :
28) Insulation :
29) ESP :
30) Spares :
31) Others :

2.2 Performance Particulars :	100% BMCR	100% TMCR	100% TMCR VWO	60% TMCR	100% TMCR HP HTR Out
2.2.1 *Super Heater Outlet Steam Flow*, t/h :					
2.2.2 *Super Heater Outlet Pressure*, kg/cm^2 :					
2.2.3 *Super Heater Outlet Temperature*, °C :					
2.2.4 *Re-heater Outlet Steam Flow*, t/h :					
2.2.5 *Steam Pressure at Re-heater Inlet*, kg/cm^2 :					
2.2.6 *Steam Pressure at Re-heater Outlet*, kg/cm^2 :					
2.2.7 *Steam Temperature at Re-heater Inlet*, °C :					
2.2.8 *Steam Temperature at Re-heater Outlet*, °C :					
2.2.9 *Temperature of Feed Water a Economizer Inlet*, °C :					
2.2.10 *Temperature of Feed Water at Economizer Inlet with HP Heaters by Passed/Out* :					
2.2.11 *Feed Water Flow*, kg/h :					
2.2.12 *Blow Down Percentage* :					
2.2.13 *Auxiliary Steam Flow Requirement in Steam Generator*, t/h :					
2.2.14 *Minimum Permissible Feed Water Temperature for Start-up* :					
2.2.14.1 *On a continuous basis*					
2.2.14.2 *On a 2 h duration basis* :					
2.2.15 *Furnace Volumetric Heat Release Rate*, kcal/m^3/h × 10^3 :					
2.2.16 *Heat Release Rate at Burner Zone*, kcal/h/m^2 × 10^3 :					
2.2.17 *Heat Input Per Plan Area of Furnace*, kcal/h/m^2 × 10^6 :					

		100% BMCR	100% TMCR	100% TMCR VWO	60% TMCR	100% TMCR HP HTR Out
2.2.17.1 *Heat loss*, percent	:					
2.2.17.2 *Dry gas*	:					
2.2.17.3 *Moisture in fuel*	:					
2.2.17.4 *Moisture in air*	:					
2.2.17.5 *Water due to combustion of hydrogen*	:					
2.2.17.6 *Unburnt carbon*	:					
2.2.17.7 *Radiation*	:					
2.2.17.8 *Unaccounted loss*	:					
2.2.17.9 *Manufacturers margin*	:					
2.2.17.10 *Total heat loss*	:					
2.2.18 *Boiler Efficiency Percent Including Heat Credits at TMCR Load Only*	:					
2.2.19 *Water/Steam Pressure*, kg/cm^2	:					
2.2.19.1 *Economizer inlet*	:					
2.2.19.2 *Drum*	:					
2.2.19.3 *Super heater inlet pressure*						
a) Primary	:					
b) Intermediate	:					
c) Final	:					
2.2.20 *Water/Steam Temperature*, °C	:					
2.2.20.1 *Economizer outlet*, °C	:					
2.2.20.2 *Super heater temperature inlet/outlet*, °C						
a) Primary	:					
b) Secondary	:					
c) Final	:					
2.2.21 *Spray Water Quantity*	:					
2.2.21.1 *Super-heater attemperator*, t/h	:					
2.2.21.2 *Emergency re-heater attemperator*, t/h	:					
2.2.22 *Fuel as Fired*						
2.2.22.1 *Quantity*, kg/h	:					
2.2.22.2 *Temperature*, °C	:					
2.2.23 *Excess Air Leaving Economizer*, percent	:					
2.2.24 *Air Temperature*, °C	:					
2.2.24.1 *Entering air heater (secondary air/primary air)*	:					
2.2.24.2 *Leaving air heater (secondary air/primary air)*	:					
2.2.24.3 *Secondary air temperature entering burner*	:					

		100% BMCR	100% TMCR	100% TMCR VWO	60% TMCR	100% TMCR HP HTR Out
2.2.24.4 *Primary air temperature entering mill*	:					
2.2.24.5 *Air fuel mixture temperature after mill*	:					
2.2.25 *Gas Temperature*, °C	:					
2.2.25.1 *Leaving furnace*	:					
2.2.25.2 *Leaving boiler*	:					
2.2.25.3 *Entering super heater*	:					
2.2.25.4 *Leaving super heater*	:					
2.2.25.5 *Entering re-heater*	:					
2.2.25.6 *Leaving re-heater*	:					
2.2.25.7 *Entering economizer*	:					
2.2.25.8 *Leaving economizer*	:					
2.2.25.9 *Entering air heater*	:					
2.2.25.10 *Leaving air heater*	:					
2.2.26 *Flue Gas Velocity*, m/s	:					
2.2.26.1 *Final super heater*	:					
2.2.26.2 *Final re-heater*	:					
2.2.26.3 *Horizontal super heater, if any*	:					
2.2.26.4 *Horizontal re-heater, if any*	:					
2.2.26.5 *Economizer*	:					
2.2.26.6 *Air heater*	:					
2.2.26.7 *Flue gas ducts*	:					
a) Economizer outlet	:					
b) Air heating outlet	:					
c) E.S. precipitator outlet	:					
2.2.27 *Air Velocity in Ducts*, m/s	:					
a) Cold air duct	:					
b) Hot air duct	:					
2.2.28 *Drafts*, mm *of Water*	:					
2.2.28.1 *Furnaces*	:					
2.2.28.2 *Economizer outlet*	:					
2.2.28.3 *Air heater outlet*	:					
2.2.28.4 *Electrostatic precipitator outlet*	:					
2.2.29 *Draft Loss for F.D. Fan*, mm *of Water*	:					
2.2.29.1 *Duct work including damper losses and others*	:					
2.2.29.2 *Air heater*	:					
2.2.29.3 *Burner and wind box*	:					

		100% BMCR	100% TMCR	100% TMCR VWO	60% TMCR	100% TMCR HP HTR Out
2.2.29.4 *Total draft loss*	:					
2.2.30 *Draft Loss for ID. Fan,* mm *of Water*	:					
2.2.30.1 *Boiler*						
a) Furnace	:					
b) Super heater	:					
c) Re-heater	:					
d) Economizer	:					
2.2.30.2 *Air heater*	:					
2.2.30.3 *Electrostatic precipitator*	:					
2.2.30.4 *Duct works, flues, dampers and others*	:					
2.2.30.5 *Total draft loss*	:					
2.2.31 *Coal and Air*						
a) Coal fired (design performance coal), t/h	:					
b) Net theoretical air required, kg/kg of coal	:					
2.2.32 *Excess Air*, percent						
a) At furnace exit	:					
b) At air heater inlet	:					
c) Air heater outlet	:					
d) At I.D. fan inlet	:					
2.2.33 *Weight of Air*, t/h						
a) Primary air	:					
b) Total combustion air	:					
2.2.34 *Weight of Flue Gas*, t/h						
a) At furnace outlet	:					
b) At super heater exit	:					
c) At re-heater exit	:					
d) At economizer inlet	:					
e) At air heater inlet	:					
f) At air heater exit	:					
g) At I.D. fan inlet	:					
2.2.35 *Pulverized Coal Fineness*	:					
2.2.35.1 *Percentage through 200 mesh*	:					
2.2.35.2 *Percentage through 50 mesh*	:					
2.2.36 *Solids in Steam*, ppm	:					
2.2.37 *Simultaneous Auxiliary Power Input*, kW	:					
2.2.37.1 *Pulverizer plant (mill, seal air fan, PA fan)*	:					
2.2.37.2 *Induced draft fans*	:					
2.2.37.3 *Forced draft fans*	:					
2.2.37.4 *Other fans, if any*	:					

		100% BMCR	100% TMCR	100% TMCR VWO	60% TMCR	100% TMCR HP HTR Out
2.2.37.5 *ESP*						
2.2.37.6 *Any other equipment*	:					
2.2.37.7 *Total, simultaneous auxiliary power consumption at TMCR load*	:					
2.2.38 *Time Required*, min						
a) For cold start to reach full load						
b) For warm start to reach full load						
c) To reach full load for hot start						
2.2.39 *Accuracy and Repeatability of the Complete Measurement, Loop Either on Line or by Lab Method here on Line is not Practicable*	:					
2.2.40 *Accuracy of Set Point(s) Maintained in Control Loop(s). The Accuracy should be Maintained by Proper Selection of Sensors, Transmitters and Other Component of Loop*	:					
2.2.41 *Identification of Variable(s) Which are Responsible to Maintain Efficiency and Targets for Optimization of*						
a) Soot blower	:					
b) Electrostatic precipitator	:					
c) Combustion	:					
d) NO_x emission	:					
e) Air preheater	:					
f) BFW pump	:					
g) Super heater	:					
h) Steam generator	:					
j) Others as per manufacturer's recommendations	:					

3 TECHNICAL PARAMETER FOR ELECTROSTATIC PRECIPITATOR

3.1 Performance Data	:	Design Coal	Worst Coal
3.1.1 *Collection Efficiency*, percent			
a) With all fields in service	:		
b) With any field of each stream out of service	:		
3.1.2 *Design Gas Flow Rate*, m^3/s	:		
3.1.3 *Dust Concentration at ESP Inlet*, g/Nm^3	:		
3.1.3.1 *With design coal*	:		
3.1.3.2 *With worst coal*	:		
3.1.4 *Dust Concentration at Outlet*, mg/Nm^3	:		
3.1.4.1 *With design coal*	:		
3.1.4.2 *With worst coal*	:		

3.1.5 *Pressure Drop of Flue Gas both Inlet/Outlet Flanges of ESP*, mm WC

a) Normal :
b) Maximum :

3.1.6 *Gas Velocity*, m/s :

3.1.7 *Specific Collection Area of Flue Gas (for all fields)*, $m^2/m^3.s$:

3.1.8 *Treatment Time* (*Min* 20 s) :

3.1.9 *Aspect Ratio* (*Min* 0.78)

3.1.10 *Design Gas Temperature*, °C (*Min* 15°C *above Max flue gas temperature*) :

3.2 Constructional Details

3.2.1 *Number of Passes/Unit* :

3.2.2 *Number of Electrical Fields in Series in the Direction of Gas Flow* :

3.2.3 *Total Number of Electrical Fields* :

3.2.4 *Collecting Electrodes* :

3.2.4.1 *Height*, m :

3.2.4.2 *Length along gas path*, mm :

3.2.4.3 *Material* :

3.2.4.4 *Type of construction* :

3.2.4.5 *Distance between collecting electrodes across gas path*, mm :

3.2.4.6 *Total projected collection area*, m^2 :

3.2.5 *Discharge Electrodes* :

3.2.5.1 *Material* :

3.2.5.2 *Type of construction* :

3.2.6 *Insulator Compartments* :

3.2.6.1 *Type and number of insulators* :

3.2.6.2 *Heating elements, number and type* :

3.2.6.3 *Fouling protection arrangement for insulators* :

3.2.7 *Rapping Mechanism* :

3.2.7.1 *Type and number of rapping mechanism*

a) Collecting electrode :
b) Discharge electrode :

3.2.7.2 *Frequency of rapping* :

3.2.7.3 *Rapping intensity* (*not less than* 100 g) :

3.2.7.4 *Rapping motor rating* :

3.2.8 *Housing* :

3.2.8.1 *Overall dimension* : Length (m) × Width (m) × Height (m)

3.2.8.2 *Thickness of housing plate*, mm :

3.2.8.3 *Design pressure/vacuum*, mm *of water* :

3.2.8.4 *Type of gas distribution arrangement* :

3.2.9 *Hoppers* :

3.2.9.1 *Thickness of plate*, mm :

3.2.9.2 *Storage capacity*, h (*minimum* 8 h *storage at BMCR load with worst coal having high ash content)* :

3.2.9.3 *Total storage capacity*, tonne :

3.2.9.4 *Number of hopper per field* :

3.2.9.5 *Valley angle of each hopper* (*Min* 60° *to the horizontal*) :

3.2.9.6 *Inside surface area of each hopper*, m² :

3.2.9.7 *Flanged outlet of each hopper for handling fly ash equipment* :

a) Type :
b) Size :
c) Elevation above ground floor level, m :

3.2.9.8 *Electric heaters in hopper (to maintain ash temperature at the bottom at or above* 120°C*)*

a) Type :
b) Number of heater per hopper :
c) Rating of each heater kW :
d) Acid dew point considered in hopper heater design, °C :

3.2.10 *Platforms, Walkways* :

3.2.10.1 *Width*, mm :

3.2.10.2 *Location* :

3.2.10.3 *Design load* :

3.2.11 *Total Power Requirement for Rated Capacity, Max*, kW :

3.2.12 *Supply Transformer* (6.6 kV/415 V) *Rating and Numbers* :

3.2.13 *Type of Insulation of Supply Transformers* :

3.2.14 *Type of Insulation Provided for Rectifier Transformers* :

3.2.15 *Type of Rectifier and Protection Arrangement Provided for Rectifier Units* :

3.2.16 *Type of Control Panel* :

3.2.17 *Type of MCCs Provided* :

3.2.18 *Brief Description of Controls Furnished* :

3.2.19 *Dust Distribution* (*Percent of Total Area*)

a) Furnace hoppers :
b) Economizer hoppers :
c) Air heater hoppers :
d) ESP hoppers :

4 TECHNICAL PARAMETER FOR FUEL OIL PRESSURE AND HEATING UNITS

4.1 Pumps :

4.1.1 *Type and Manufacturer* :

4.1.2 *Numbers* :

4.1.3 *Capacity of Each Pump*, t/h :

4.1.4 *Discharge Pressure*, kg/m² :

4.1.5 *Speed*, rev/min :

4.1.6 *Material of Construction*

a) Casing :
b) Rotors :
c) Shaft :

4.1.7 *NPSH Requirement*, m :

4.1.8 *Temperature of Oil at Pump Suction*, °C :

4.1.9 *Power Requirement*, kW :

4.1.10 *Drive Arrangement Details* :

4.1.11 *Relief Valve Type* :

4.1.12 *Capacity*, t/h :

4.1.13 *Pressure Setting Range*, kg/cm² :

4.1.14 *Steam Jacketing Arrangement Details* :

4.1.15 *Heating Tracing Steam Pressure and Quantity*, kg/h and kg/cm² :

4.2 Heaters :

4.2.1 *Design and Fabrication Code* :

4.2.2 *Type and Manufacturer* :

4.2.3 *Quantity Provided* :

4.2.4 *Design Oil Flow Rate*, t/h :

4.2.5 *Design Oil Temperature*, °C :

a) Inlet :
b) Outlet :

4.2.6 *Steam Pressure*, kg/cm² :

4.2.7 *Steam Quantity Required*, kg/h :

4.2.8 *Heater Surface Area*, m² :

4.2.9 *Material of Construction*

a) Shell :
b) Tubes :

c) Tube sheet :
d) Code followed for design and fabrication :

4.2.10 *Safety Relief Valve Particulars*

a) Type :
b) Size and capacity :
c) Material of construction :

4.3 Strainers (F.O. Pump Suction/F.O. Heater Exit) :

4.3.1 *Type and Manufacturer* :

4.3.2 *Open Area Ratio (Approximately)* :

4.3.3 *Number of Strainers* :

4.3.4 *Material of Construction*

a) Body :
b) Wire mesh material and size :

4.3.5 *Design Flow Capacity*, kg/h :

4.3.6 *Pressure Drop*, kg/cm^2 :

4.3.7 *Steam Jacketing Details* :

4.3.8 *Heating Tracing Steam Pressure and Quantity*, kg/cm^2 and kg/h :

4.4 Re-circulation Control Valves :

4.4.1 *Type and Manufacturer* :

4.4.2 *Number of Valves Provided* :

4.4.3 *Capacity*, kg/h :

4.4.4 *Pressure Setting Range*, kg/cm^2 :

4.4.5 *Material of Construction* :

4.5 Weight Data (Approximately) :

4.5.1 *Pumps Set inclusive of Drive Motor*, kg :

4.5.2 *Heaters, Each in* kg :

4.6 Detail of LP and HP Chemical Dosing System :

4.7 Detail of Painting :

ANNEX A

(*Foreword*)

LIST OF DRAWING AND DOCUMENTS (TO BE SUPPLIED BY MANUFACTURERS AGAINST ENQUIRY/QUOTATION)

A-1 GENERAL ARRANGEMENT (CROSS-SECTIONAL ELEVATION AND PLAN) AND LAYOUT OF BOILER UNIT ALONG WITH ACCESSORIES, SPACE REQUIRED

A-2 P AND I DIAGRAM

a) Steam and water circuit
b) Air and flue gas circuit
c) Fuel circuit

A-3 PFD (PROCESS FLOW DIAGRAM)

a) Steam and water circuit
b) Air and flue gas circuit
c) Fuel flow

A-4 VALVE SCHEDULE

A-5 DETAILED SCOPE OF SUPPLY

A-6 FILLED UP TECHNICAL PARAMETERS

A-7 Description of steam boiler system highlighting the following:

a) Fuel preparation, air and firing system,
b) Draught system,
c) Dust precipitation and collection system,
d) Soot blowing system,
e) Structural steel and duct work,
f) Insulation, refractory and painting work,
g) Electrical system along with single line diagram for MCC/type of motors/rating/frequency/speed/rated voltage/enclosure protection/class of insulation/frame size etc.,
h) Control and instrumentation system including trip logics and burner management system, and
j) Procedure for chemical cleaning and passivation.

A-8 CODES, STANDARDS AND REGULATIONS

A-9 SPARE PARTS LIST FOR

a) 2/3 years operation, and
b) Erection and commissioning.

A-10 SPECIAL TOOLS AND TACKLES LIST FOR OPERATION AND MAINTENANCE

A-11 TYPICAL QAP OF BOILER COMPONENTS AND ACCESSORIES

A-12 DETAILED REFERENCE LIST

A-13 BAR AND PERT CHARTS

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Boilers and Pressure Vessels Sectional Committee, ME 01

Organization	*Representative(s)*
Central Boilers Board, New Delhi	Shri V. K. Goel (***Chairman***) Shri M. L. Ahuja (*Alternate*)
Alstom Project India Ltd, Durgapur/Delhi	Shri Ramesh T. Yavagal Shri P. K. Pal (*Alternate*)
Bharat Heavy Electricals Ltd, Tiruchirapalli	Shri G. Uma Shanker Shri K. Padmanaban (*Alternate*)
Bharat Heavy Plate and Vessels Ltd, Visakhapatnam	Shri M. S. V. S. N. Murthy Shri C. H. Ramanaiah (*Alternate*)
Bureau Veritas, Mumbai	Shri A. U. M. Rao Shri V. Kumar (*Alternate*)
Central Electricity Authority, New Delhi	Shri A. K. Gupta Shri D. K. Gilhotra (*Alternate*)
Central Mechanical Engineering Research Institute (CSIR), Durgapur	Shri P. R. Samaddar Shri P. K. Sen (*Alternate*)
Chief Inspector of Boilers, Chennai	Shri T. K. Thambithurai Shri Thiru K. Regunath (*Alternate*)
Department of Atomic Energy, Mumbai	Shri H. S. Kushwaha Shri K. K. Vaze (*Alternate*)
Development Consultants Pvt Ltd, Kolkata	Shri Dipak K. Sarkar Shri Asim Kumar De (*Alternate*)
Directorate General of Fact Adv Services and Labour Institute, Mumbai	Shri M. S. Tyagi Shri P. K. Saxena (*Alternate*)
Engineers India Limited, New Delhi	Shri V. J. Nalgirkar Shri A. K. Malik (*Alternate*)
Indian Boilers Manufacturers' Association, Mumbai	Shri N. B. Tapaswi
Indian Oil Corporation Ltd, Vadodara	Shri U. S. Prasad Shri R. K. Sabharwal (*Alternate*)
Indian Register of Shipping, Mumbai	Shri A. K. Sharma Shri I. Majumdar (*Alternate*)
Industrial Boilers Ltd, Mumbai	Shri R. N. Engineer
Larsen and Toubro Ltd, Mumbai	Shri G. K. Sadekar Shri S. S. Iyer (*Alternate*)
Lloyd's Register Asia, Mumbai	Shri B. Saraswat Shri P. K. Banerjee (*Alternate*)
Mecon Limited, Ranchi	Shri Om Prakash Shri B. K. Verma (*Alternate*)
National Thermal Power Corporation Ltd, Noida	Shri D. K. Jain Shri P. K. Dev (*Alternate*)
Oil Industries Safety Directorate, New Delhi	Shri S. C. Gupta Shri Shamsher Singh (*Alternate*)
Petroleum and Explosive Safety Organization, Nagpur	Shri M. Anbunathan Shri A. N. Biswas (*Alternate*)
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Tata Iron and Steel Company Ltd, Jamshedpur	Dr M. D. Maheshwari Shri C. B. Lunawat (*Alternate*)

Organization	*Representative(s)*
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Welding Research Institute, Tiruchirapalli	Shri G. Uma Shanker
In personal capacity (*Qualiquest Industrial Services, 26, ManakVihar, New Delhi*)	Shri M. G. K. Rao
BIS Directorate General	Scientist 'F' and Head (MED) [Representing Director General (*Ex-officio*)]

Member Secretary
Shri C. K. Veda
Scientist 'F' and Head (MED), BIS

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